REMARKS

Claims 1 through 14 are presently pending in this application. Claims 6-14 remain withdrawn from consideration.

At the outset, Applicants acknowledge the Examiner's indication in the present Office Action that the restriction requirement has been made final. Accordingly, the Examiner has examined claims 1-5 on the merits.

The Examiner notes in the Office Action Summary that none of the copies of the certified copies of the priority documents have been received in this National Stage Application from the International Bureau. Enclosed are courtesy copies of the PCT Notification Concerning Submission or Transmittal of Priority Document and of the PCT Notice Informing the Applicant of the Communication of the International Application to the Designated Offices, which indicate that the priority documents were received by the International Bureau and communicated to the United States as a designated office. Acknowledgement of receipt of the priority documents is respectfully requested.

Claim 1 has been amended to more particularly claim the invention by describing the carbon particles more specifically. Support for this amendment is found at least in paragraphs [0028] through [0031] of the present application. Claims 2 to 4 have been amended to correctly depend from claim 1 and are further supported by at least paragraphs [0053] through [0055], and [0028] through [0031] of the present application. Claims 8 and 9 have been amended for clarity and remain withdrawn. Paragraph [0031] has been amended in order to incorporate subject matter from paragraph [0075], original claim 4, and Table 1. Accordingly, the amendments are fully supported by the original claims, and no new matter has been added. Entry of these amendments is respectfully solicited.

Objection to the Drawings

The Examiner has objected to the drawings on the grounds that Figure 7b should be labeled "PRIOR ART." Accordingly, a replacement sheet of drawings containing Figure 7b is submitted herewith which contains such a label. No new matter has been added, and reconsideration and withdrawal of the objection to the drawings are respectfully solicited.

Objection to the Specification

The Examiner has objected to the specification as failing to provide proper antecedent basis for "particle sizes of hydrogen ion conductive polymer electrolyte adsorbed to said first and second carbon particles are within a range of 30 to 200 nm and a range of 200 to 500 nm, respectively, when measured by a light-scattering photometer" which is recited in claim 4. By this amendment, paragraph [0031] has been amended to add this description of the particle sizes and to provide antecedent basis for the claim. Accordingly, reconsideration and withdrawal of the objection to the specification are respectfully solicited.

Rejection under § 112

The Examiner has rejected claims 1-5 under 35 U.S.C. § 112, second paragraph, as being indefinite with respect to the phrase "mutually different dispersed states." The Examiner argues that it is unclear what this phrase means since a mixture of two types of carbon particles described in paragraphs 84 and 85 were dispersed by a bead mill to form a catalyst layer. Applicants respectfully traverse this rejection because by this amendment, the phrase "mutually different dispersed states" has been deleted. The claims now clearly recite that the polymer electrolytes adsorbed onto two kinds of carbon particles (catalyst supports) are dispersed in different manners. Specifically, in the Examples of the instant application, the size of the polymer electrolyte adsorbed onto one kind of particles is different from the size of the polymer electrolyte adsorbed onto the other kind of carbon particles, and therefore the polymer electrolytes are dispersed in different manners. Accordingly, it is respectfully requested that the rejection be removed.

Prior Art Rejections

Claims 1-3 and 5 have been rejected under 35 U.S.C. § 102(b) as being anticipated by United States Patent Number 5,728,485 to Watanabe et al. ("Watanabe"). Claims 1-3 and 5 have been rejected under 35 U.S.C. § 102(b) as being anticipated by United States Patent Number 5,766,788 to Inoue ("Inoue"). Claim 1 is rejected under § 102(b) as being anticipated by the IPDL JPO Machine Translation for JP 10-189004 A ("JP '004"). Applicants respectfully traverse these rejections and the arguments in support thereof as follows, and respectfully request reconsideration and withdrawal of the rejections.

Rejection Under § 102(b) Based on Watanabe

Regarding claims 1-3 and 5, the Examiner argues that Watanabe discloses a polymer electrolyte fuel cell comprising a hydrogen ion conductive polymer electrolyte membrane, and a pair of electrodes having catalyst layers sandwiching the hydrogen ion conductive polymer electrolyte membrane therebetween and gas diffusion layers in contact with the catalyst layers. The Examiner further argues that the electrode can be made of two kinds of catalyst carbon supports (one which is granular and one which is fiber) that are in mutually different dispersed states in a polymer electrolyte. The Examiner also suggests that the granular carbon particles supporting the catalyst are coated with a first electrolyte solution and then a second electrolyte solution. The Examiner further suggests that an electrode prepared in this manner would have secure contact between the catalyst and the solid polymer electrolyte and a smooth formation of the electrocatalyst layer on the electrode substrate, which would inherently have a 85° glossiness. Applicants respectfully traverse this rejection as follows.

The present invention encompasses a polymer electrolyte fuel cell having an increased reaction area. The polymer electrolyte fuel cell includes a hydrogen ion conductive polymer electrolyte membrane and a pair of electrodes having catalyst layers sandwiching the hydrogen ion conductive polymer electrolyte membrane between them and gas diffusion layers in contact with the catalyst layers. At least one of the catalyst layers of one of the electrodes is made of carbon particles supporting a noble metal catalyst. The carbon particles include at least a first and a second type of carbon particle. The first type of carbon particles adsorb a first hydrogen ion conductive polymer electrolyte and the second type of carbon particles adsorb a second hydrogen ion conductive polymer electrolyte. The first and the second carbon particles may be identical or different, and the first and the second hydrogen conductive polymer electrolytes are different in size and are dispersed differently.

Watanabe teaches that two kinds of carbon (catalyst supports) of different sizes are coated with polymer electrolytes, namely, first and second polymer electrolyte solutions. However, the two kinds of carbon are coated with the first and second polymer electrolytes under the same conditions. Therefore, the coating method according to Watanabe is different from the present invention, in which polymer electrolytes of different sizes are adsorbed and dispersed differently onto two kinds of carbon which may be the same or different.

Also, the Examiner acknowledges that Watanabe does not disclose or suggest that the 85° glossiness of the surface of the catalyst layer is not less than 20% as claimed, but argues that this feature would be inherent in the catalyst of Watanabe. However, according to the present invention, the claimed level of the glossiness is reliably attained by using a bead mill. Such glossiness produces the effect as stated in paragraph [0086] of the specification – "the void between the particles is small, and the catalyst layer is formed as a dense layer." If this level of glossiness is not achieved, the catalyst layer becomes cracked and water accumulates in the cracks, which results in flooding. Consequently, the present invention is able to prevent this flooding phenomena. Accordingly, because Watanabe does not teach or suggest a bead mill, the claimed level of glossiness would not be inherent in the surface of the catalyst layer of Watanabe. Therefore, Watanabe does not teach or suggest all of the claimed elements, and it is respectfully requested that the § 102(b) rejection based on Watanabe be removed.

Rejection Under § 102(b) Based on Inoue

Regarding claims 1-3 and 5, the Examiner argues that Inoue discloses a polymer electrolyte fuel cell which has an electrode made of carbon catalyst-loading particles which have two particle distribution peaks. Specifically the platinum-carbon catalyst particle distribution allegedly has one peak between 0.1 and 1 micron and another peak between 1.0 and 10 microns. The Examiner further states that the carbon particles were then impregnated with a commercially dispersed solution of ion resin, which was added to ethanol, the mixture was dispersed with an ultrasonic homogenizer and the resulting dispersion was transferred onto carbon paper to further prepare the electrode. The Examiner argues that because the pulverized carbon particles of Inoue have a particle size distribution that allegedly overlaps with that disclosed in the present application, the homogenized mixture applied to the carbon paper to form the electrode would result in a dense and smooth catalyst layer that would inherently have the claimed 85° glossiness of not less than 20%. The Applicants respectfully traverse this rejection as follows.

Inoue discloses a polymer electrolyte fuel cell comprising carbon catalyst-loading particles having two particle distribution peaks. However, Inoue does not disclose a fuel cell in which the size of the adsorbed polymer electrolytes are different, as is claimed in the present invention. The same argument regarding glossiness, as discussed above, applies. Therefore, Inoue does not teach or suggest all of the claimed elements. Accordingly, it is respectfully requested that the § 102(b) rejection based on Inoue be removed.

Rejection Under § 102(b) Based on JP '004

Regarding claim 1, the Examiner argues, relying on a machine translation, that JP '004 discloses a polymer electrolyte fuel cell constructed of an electrode that has two or more carbon catalyst support particles with different water repellence and therefore anticipates the present invention. The Applicants respectfully traverse the rejection as follows.

According to the present invention, the size of the polymer electrolyte adsorbed to the carbon particles is controlled by: (i) the concentration of the polymer electrolyte in the dispersion and (ii) the composition of the dispersion, as shown in Table 1 of Example 7. JP '004 uses carbon blacks with different water repellency. However, even if such carbons were to be used to prepare the above-mentioned dispersion, both carbons are thought to become wet with the dispersion. Thus, it is unlikely that the water repellency of carbon particles affects the size of the polymer electrolyte adsorbed to the carbon particles. The above-mentioned factors, (i) and (ii), have a great effect on the size of the polymer electrolyte and JP '004 is silent about factors (i) and (ii). Therefore, JP '004 does not teach or suggest all of the claimed elements and it is respectfully requested that the § 102(b) rejection based on JP '004 be removed.

In view of the above amendments and remarks, it is submitted that the specification, claims and drawings fully comply with all formal requirements. In view of the preceding remarks it is respectfully submitted that the claims patentably distinguish over the prior art of record. Reconsideration and Allowance of this application are respectfully requested.

Respectfully submitted,

MAKOTO UCHIDA, *et al.*

January 21, 2005 (Date) By: [signature] Reg. No. 25,918

SANDRA M. KATZ
Registration No. 51,864
AKIN GUMP STRAUSS HAUER & FELD LLP
One Commerce Square
2005 Market Street, Suite 2200
Philadelphia, PA 19103-7013
Telephone: 215-965-1200
Direct Dial: 215-965-1344
Facsimile: 215-965-1210
E-Mail: skatz@akingump.com

SMK:CRB:cmb
7334169

Enclosures: Replacement Sheet 6 containing Figure 7b
Copy of PCT Notification Concerning Submission or Transmittal of Priority Document;
Copy of PCT Notice Informing the Applicant of the Communication of the International Application to the Designated Offices

Amendments to the Drawings:

Attached is a replacement sheet for the sixth sheet of drawings which contains Figure 7b, which has been amended to insert the legend "PRIOR ART" as requested by the Examiner.